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Inventors: Jonathan G. Riley, Tim Baker, Ernie Fischer

A TOOL CHUCK HAVING A LIGHT TRANSMITTING CAPABILITY

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## 1        A TOOL CHUCK HAVING A LIGHT TRANSMITTING CAPABILITY

2            The present invention generally relates to power hand tools and more  
3 particularly to a tool chuck for the same.

4            Small rotary hand tools that have a generally cylindrical housing or case  
5 have been marketed for many years for use in carrying out various woodworking  
6 and metal working tasks by hobbyists as well as commercial artisans. Such rotary  
7 hand tools generally have a motor unit with a rotary output shaft extending from  
8 the nose end and often have a nose portion that is configured to connect to various  
9 accessories or attachments. Some of these rotary hand tools are somewhat larger  
10 and more powerful and are known in the building trade as spiral saws that use a  
11 side cutting bit to penetrate and to rapidly cut holes for electrical outlets, light  
12 fixtures and switches and the like in dry wall. Because these tools are quite  
13 powerful even though they are relatively small, they are convenient to use on a  
14 jobsite or just about anywhere else where a source of AC power is available.

15           Because such power hand tools can be used to perform many tasks, some of  
16 which may be in locations where the ambient light is not particularly good, a  
17 recent development has involved placement of lights at the nose end of the hand  
18 tool which are illuminated by means of an onboard generating system, typically in  
19 the form of a magnet being located on the output shaft that creates a magnetic field  
20 that is induced into an inductive coil or inductor which generates a current that is  
21 used to illuminate a light producing device. While many types of light producing  
22 devices can be used, solid-state light emitting diodes (LEDs) are preferred because  
23 they are not prone to being easily damaged and do emit sufficient amounts of light  
24 to illuminate the work area without consuming an appreciable amount of power.

The nose portion of the hand tool may preferably have a cylindrical shape on which various attachments may be mounted, it may be desirable to have light producing devices in the nose portion close to the work area when the tool is used with a small cutting bit for example. In that type of operation, it is necessary to use a tool chuck to hold the cutting bit, and the chuck may partially block the light from illuminating the work area, particularly if the chuck is one that can be hand tightened which must necessarily have a larger diameter in order to effectively grip it. Accordingly, a preferred embodiment of a tool chuck embodying the present invention conveniently transmits light through the chuck and directs it toward the work area.

## 11 Summary of the Invention

A preferred embodiment of the invention comprises a tool chuck for a power hand tool of the type which has a generally cylindrical elongated housing with a motor contained within the housing or case and the motor having an output shaft that extends from the nose end of the hand tool, and which has one or more light producing devices located at its nose end for illuminating the work area during operation. The preferred embodiment of the tool chuck has an annular cylindrical light transmitting portion on the outside of the chuck body portion for transmitting light toward a tool bit held by the tool chuck. The preferred embodiment may have an inwardly oriented front end surface to direct the transmitted light toward the axis of the tool bit and may have an outer layer of resilient material to facilitate easy gripping of the tool chuck to tighten or loosen a tool bit

## Description of the Drawings

FIGURE 1 is a side view of the preferred embodiment of the tool chuck of the present invention shown together with the nose portion of a power hand tool having portions removed and simplified to illustrate the light generating devices, and with the tool chuck shown partially in cross section;

FIG. 2 is a front plan view of the power hand tool shown in FIG. 1, but without the tool chuck being illustrated;

FIG. 3 is an enlarged side view of the tool chuck shown in FIG. 1, shown together with the power hand tool as shown in FIG. 1, and the tool chuck shown partially in section;

FIG. 4 is an end view of the tool chuck shown in FIG. 1.

## Description of the Preferred Embodiment

The preferred embodiment of the tool chuck indicated generally at 10 is designed to fit on an output shaft 12 of a rotary power hand tool, indicated generally at 14, that has a generally cylindrical shape as illustrated in FIG. 1. However, it should be understood that the tool chuck is suitable for use with other tools, such as power drills, routers and the like which require a mechanism for holding the shank of a bit or other tool. Because of its unique properties, it is best suited to be used with a power hand tool that has light generating devices located on board which illuminate the work area of the tool bit that is being held by the tool chuck. The power hand tool 14 has a motor (not shown) that drives the output shaft 12 that is shown to have a hollow interior portion 16 with the outside of at least the outer end being threaded for engaging interior threaded portion of the chuck 10. The hand tool 14 has a generally cylindrically shaped nose portion 18 which is configured to engage attachments and accessories that are used with the hand tool 14, such as, for example, an adjustable depth guide that extends beyond

1 the chuck and limits the depth of cut of a tool bit 20 or a right angle attachment  
2 that may have a saw blade or grinding wheel attached to it. The nose portion 18  
3 has an annular front surface 22 in which a pair of light producing devices 24 are  
4 located as best shown in FIGS. 1 and 2 and are preferably light emitting diodes  
5 because they are small, reliable, rugged and do not consume an appreciable  
6 amount of power during operation. While the type of light producing devices 24  
7 and their manner of operation is not part of the present invention, the LED's may  
8 be driven by a magnet attached to the output shaft which creates flux lines that  
9 induce a current in an inductor which are connected to the LED's 24. As best  
10 shown in FIGS. 1 and 3, the location of the LED's 24 is conveniently in the front  
11 face 22 which comprises a generally flat annular ring and there is no other  
12 desirable location in which to place the LED's if they are to be integral with the  
13 housing, with the LED locations, it is apparent that the chuck 10 would block the  
14 light being emitted in the direction parallel to the shaft 12 and any bit 20. While  
15 tool chucks can be made that would have a smaller outside diameter, it is very  
16 desirable to be able to install a bit 20 and remove it without the use of external  
17 tools. If the chuck is to be used without tools, it must necessarily have a larger  
18 outer diameter that will enable a user to conveniently grip the tool chuck to tighten  
19 or loosen the same. It should be understood that rotary hand tools such as the tool  
20 14 typically have a locking lever 26 shown in FIG. 2 which can be moved radially  
21 inwardly toward the output shaft and engage an opening in it to hold the shaft  
22 while the tool chuck is rotated to either install or remove a tool bit 20. To  
23 accommodate the larger size without blocking the light from the LED's 24, the  
24 preferred embodiment of the present invention has a transparent outer portion that  
25 transmits the light from the LED's to the work area of the tool bit 20. More  
26 particularly and referring to FIG. 3, the tool chuck 10 has a body portion 30 that is  
27 generally cylindrically shaped with a conically shaped inner chamber 32, a tool  
28 opening 34 and an outer hex-shaped configuration 36 which enables a wrench to  
29 be used in the event that the user cannot loosen the tool chuck with his hands or

1 wishes to tighten it tighter than he can by hand. The body portion 30 has a rear  
2 cylindrical base portion 38 with a transverse extension 40 defining a base opening  
3 42 that is threaded to engage the outer threads of the output shaft 12. An annular  
4 cylindrical light transmitting portion 44 is attached to the outer surface of the body  
5 portion 30 and it has a front annular surface 46 that is angled inwardly as shown  
6 for the purpose of redirecting light toward the axis of the output shaft 12 or toward  
7 the tool bit 20 as shown in FIG. 1, using the principles of internal reflection, which  
8 is sometimes also known as internal refraction. The light transmitting portion is  
9 preferably transparent, but may be translucent if it still transmits sufficient light  
10 that the work area is sufficiently illuminated. Similarly, while the surface 46  
11 redirects the light inwardly, such an angled surface may not be required depending  
12 upon the placement of the LED's 24, the width of the portion 44 (width being in  
13 the radial direction). To facilitate tightening and loosening of the tool chuck 10, a  
14 relatively thin layer of rubber or rubberlike 48 material is formed on the outer  
15 surface of the light transmitting portion 44 to facilitate the user gripping the tool  
16 chuck during tightening or loosening of it. As shown in FIG. 4, the layer 48 may  
17 have a number of raised ribs 50 spaced apart from one another around the  
18 periphery of the layer to provide added gripping capability.

19 The interior components of the tool chuck 10 are generally conventional in  
20 that a core member, indicated generally at 52, having a reduced diameter  
21 cylindrical end portion 54, a conical segment 56, an enlarged cylindrical portion  
22 58 with an interior chamber 60 in which the shank end of a bit 20 may be inserted  
23 and an outer cylindrical flange 62 that bears against three elongated jaws 64 of  
24 which two are shown. The jaws 64 are preferably equally spaced around the  
25 interior of the chamber 32 and are biased away from one another by compression  
26 springs 66 located between each adjacent jaw 64. The outer surface of the jaw 64  
27 conforms to the conical shape of the chamber 32 so that when the core 52 is  
28 moved to the right, the jaws are moved to the right as well as inwardly to tighten  
29 and secure the shank of a tool bit such as tool bit 20 shown in FIG. 1. During

1 operation, rotation of the tool chuck 10 causes the body to move axially relative to  
2 the output shaft 12 which causes the end of which engage the flange 62 of the core  
3 52 and move it relative to the body portion 30 and similarly move the jaws 64. It  
4 should be appreciated that while the preferred embodiment has the conventional  
5 three internal jaws, the present invention can encompass other types of chucks,  
6 such as constructions which have a collet, for example.

7 The rotary hand tool 14 with a side cutting bit 20 is generally known in the  
8 building trades as a spiral saw which utilizes a side cutting bit 20 and is used to cut  
9 openings in drywall during construction for light fixtures, electrical outlets and  
10 switches and the like. Because it is relatively lightweight and powerful, such tools  
11 are convenient and effective to perform these cutting tasks.

12 The base portion 38 is preferably separately fabricated from the body  
13 portion 30 and may be press fit into the chamber 32 or otherwise firmly secured  
14 therein. It is preferred that the light transmitting portion 44 be made of polyester  
15 and the molded in situ to the body 30. In this regard, it is also preferred that the  
16 outer surface of the body portion 30 be provided with an irregular surface so that  
17 the light transmitting portion 44 will be firmly molded in place. It is also preferred  
18 that the thin layer of rubber or rubber-like material 48 be molded in place onto the  
19 light transmitting portion 44, but it is of course possible to separately make the  
20 layer 48 and secure it to the transmitting portion 44 with an adhesive, cement or  
21 the like. The preferred polyester is a copolyester marketed by Eastman Chemical  
22 Company under the tradename "Estar" and Product No. DN010.

23 While various embodiments of the present invention have been shown and  
24 described, it should be understood that other modifications, substitutions and  
25 alternatives are apparent to one of ordinary skill in the art. Such modifications,  
26 substitutions and alternatives can be made without departing from the spirit and  
27 scope of the invention, which should be determined from the appended claims.

28 Various features of the invention are set forth in the following claims.